

EXTENT OF VISITOR USE

Visitor use monitoring serves as a gauge of park visitor use activity, reflecting visitor use levels and behaviors that potentially cause negative impacts such as crowding, user conflict, noise and other visitor caused disturbances on both natural resources and the visitor experience. The extent of visitor use measures overall recreation use and helps to protect the Outstandingly Remarkable Values (ORVs) in both the Merced and Tuolumne Wild and Scenic River corridors.

Standards in Development: This indicator is still in development stages and encompasses a variety of visitor use studies throughout Yosemite National Park.

Introduction

The extent of visitor use was selected as a potential indicator, because of the need to understand the relationship among overall use levels, visitors' experience, and natural resource conditions along the Merced and Tuolumne River corridors. This indicator directly represents both Recreation and Scenic ORVs and is correlated to all other values established for the river corridors. The extent of visitor use serves as an indicator of overall visitor use levels at points of interest including trails, attraction sites, and in-river recreational sites. Crowding and congestion have been shown to degrade the quality of visitor experiences (Manning, 1999; Manning, 2007) and can have a negative impact on the park's resources (Hammit & Cole, 1998).

A variety of visitor use data was collected in Yosemite National Park during the summer of 2010 using several approaches concurrently (Table 1): 1) people-at-one-time (PAOT) on riverbanks was documented along four sections of the Merced River; 2) automated visitor counters were placed on several trails throughout the park, including the Tuolumne and Merced River corridors to determine the actual number of people utilizing those trails; 3) inter-group encounter rates in wilderness; 4) automated vehicle traffic counters were employed at all entrance stations and at various locations in Yosemite Valley to determine the quantity and timing of vehicle use; and 5) vehicle at one time (VAOT) counts of parking availability were conducted in formal parking areas in Yosemite Valley.

One of the main challenges to estimating visitor use in natural areas is the dispersed and expansive nature of recreation areas. The primary problem in estimating dispersed recreational use is defining applicable use areas to sample. Typically, PAOT is sampled in clearly defined discrete plots. PAOT is a measure that is used as a proxy for overall visitor use and conditions of crowding, and has been used successfully in previous studies (Lawson et al., 2008; Pettebone et al., 2009). PAOT is not a measure of the total number of people who visit a recreation site; rather it is a measure of use levels across time that can be applied to understanding social conditions related to the visitors' experience (Manning, 1999; Manning, 2007). PAOT counts were conducted along both sides of four sections of the Merced River during the summer of 2010 for a total of 8 study sites. Calibrations included hour-long sampling periods, broken into four 15-minute segments, for a total of 36 counts during a 9 hour day, beginning at 10:00 am and ending at 7:00 pm. Each location was observed for an average of 4.5 days, including weekend and weekdays.

The vast majority of visitors to Yosemite National Park arrive in private vehicles, and more than a million vehicles enter Yosemite Valley each year, resulting in significant traffic congestion (Figure 1). Traffic congestion can cause a variety of impacts to ORVs including natural and cultural resources as well as the quality of the visitor experience. Specific impacts include increased travel and waiting times, wildlife depredation, air pollution, noise, vegetation loss, and others. Automated vehicle counters were employed at all park entrance stations and at several locations along the Merced River corridor to capture vehicle volume and temporal data. Vehicle counters collect data 24 hours per day, 7 days per week.



Figure 1 Vehicular traffic along the Merced River corridor in Yosemite Valley

Visitor counts were collected via automatic counters on several trails within both the Merced and Tuolumne River corridors during 2010. Automated counters provide quantitative data on visitor use, information necessary for determining the implications of current trail use levels on natural resources and visitor experience. Trail use counters collect data 24 hours per day, 7 days per week.

Parking availability, which has previously served as an indicator of overall traffic congestion in Yosemite Valley, has potential application as an early warning sign suggestive of the extent to which the Merced or Tuolumne River corridors can be affected by human vehicular use. Parking availability is measured by vehicle-at-one-time (VAOT) counts taken in areas formally assigned for parking. In 2010 VAOT parking

availability data was collected in 15-30 minute intervals between 7:00 AM and 7:00 PM at both Camp 6 and the Wilderness Parking Lot in Yosemite Valley.

These data analyses provide insights into the spatial and temporal trends of visitor use in the Merced and Tuolumne River corridors. One of the central goals of estimating visitor use for the Yosemite Impact Monitoring Program is to correlate visitor use data to ecological conditions. A primary objective of the 2010 studies was to develop protocols to estimate visitor use levels in order to achieve this goal.

Findings and Highlights

Table 1 Extent of Visitor Use: Parameters, Plan/Application, Standard & Observed Condition

Parameter	Plan/Application	Standard	Observed Condition
(Riverbank) People at One Time (PAOT)	In development as a potential indicator for the Merced River corridor	Standards for the Merced River corridor people at one time are currently being developed.	The maximum number of PAOT observed was 36, but means ranged from a high of 4.91 to a low of 0.26. The overall mean was 2.38 PAOT.
Vehicle Volume	In development as a potential indicator for the Merced River corridor	Standards for the Merced River corridor vehicle volume are currently being developed.	Data analysis in progress
Visitor Counts	In development as a potential indicator for the Merced River corridor	Standards for the Merced River corridor visitor counts are currently being developed.	Data analysis in progress
Parking Availability, Vehicles at One Time (VAOT)	Draft Tuolumne River Plan/In development as a potential indicator for the Merced River corridor	Maximum vehicles at one time standard would vary by alternative, depending on the desired visitor use and associated user capacity.	Data analysis in progress

Over 1000 PAOT counts were taken along both banks of the Merced River at four locations, equating to eight sites, during the summer of 2010. These data reveal that visitor use is significantly different on weekends than on weekdays and that on average, use levels peak at 2:30 pm. The maximum number of PAOT observed at any one site was 36, but means ranged from a high of 4.91 to a low of 0.26. The overall mean was 2.38 PAOT. Data analyses for the remaining parameters are in progress and will be reported upon as soon as they have been completed.

Conclusion & Future Implications

Preliminary results from 2010 suggest similar temporal and geographic visitor use patterns as previous visitor use studies that have been conducted in Yosemite NP. Specifically, visitor use exhibits variation across temporal scales (i.e. daily and seasonally) and concentrated use at specific geographical locations. Moreover, further statistical analyses show strong relationships between visitor use levels (e.g. visitor use trail counts collected by automated counters) and indicators of visitor experience (e.g. inter-group wilderness encounters). Thus, the suite of variables under the umbrella of the “Extent of Visitor Use” indicator provides foundational data from which to evaluate *if* visitor use levels are related to experiential/natural resource/and cultural indicators. Moreover, analyses to evaluate relationships between visitor use levels and experiential/natural resource/and cultural indicators provide understanding about the type of relationship (i.e. linear or exponential) that exists among these variables. By understanding these relationships, park managers will be able to develop tools to better manage conditions in order to provide for the best visitor experience possible while maintaining the outstanding natural resources that define Yosemite National Park. Annual monitoring of every area throughout Yosemite would be infeasible, but by constructing a model of these relationships only a subset of attraction sites, trails and roads will need to be monitored in any given year in order determine use levels throughout the park. Although specific standards are still in development, Yosemite will continue collecting social and natural resource baseline data through the ongoing development of Yosemite’s Visitor Use and Impacts Monitoring Program.